

Chapter C2: Summary of Current Losses Due to I&E

INTRODUCTION

This chapter summarizes the results of the seven regional analyses and presents the total monetary values of national baseline losses for all 554 facilities subject to the Final Section 316(b) Phase II Existing Facilities Rule. For a discussion of the monetary values of the national economic benefits expected from reducing impingement and entrainment (I&E) losses, refer to Chapter C3 of this document.

CHAPTER CONTENTS

C2-1 Summary of I&E Losses	C2-1
C2-2 Summary of Losses: Economic Value	C2-2
References	C2-4
Appendix to Chapter C2	C2-5

Greater detail on the methods and data used in the regional analyses are provided in Chapter C1 of this EBA and in the Regional Study Document (U.S. EPA, 2004): the methods used to estimate I&E are described in Chapter A5; the methods used to estimate the value of the benefits of prevented I&E losses are described in Chapters A9 through A15; the results of the regional analyses are presented in Parts B through H; and a summary of national benefits is provided in Part I.

C2-1 SUMMARY OF I&E LOSSES

Using standard fishery modeling techniques, EPA constructed models that combined facility-derived impingement and entrainment counts with relevant life history data to derive estimates of:

- (1) age 1 equivalent losses (the number of individual organisms of different ages impinged and entrained by facility intakes, expressed as age 1 equivalents¹),
- (2) foregone fishery yield (pounds of commercial harvest and numbers of recreational fish and shellfish that are not harvested due to impingement and entrainment, including indirect losses of harvested species due to losses of forage species), and
- (3) foregone biomass production (the expected total amount of future growth of impinged and entrained organisms, expressed as pounds, had they not been impinged or entrained).

Note that estimates of foregone fishery yield include the yield of harvested species that is lost due to losses of forage species as well as direct losses of harvested species. The conversion of forage to yield contributes only a very small fraction to the total foregone yield. Details of the methods used for these analyses are provided in Chapter A5 of the Regional Study Document. For all analyses, EPA assumed 100 percent entrainment mortality based on the analysis of entrainment survival studies presented in Chapter A7 of the Regional Study Document.

Table C2-1 presents EPA's estimates of the current I&E losses in each region. The table shows that total national losses of age 1 equivalents for all 554 facilities equals 3.4 billion fish. Nationwide, EPA estimates that 165.0 million pounds of fishery yield is foregone under current rates of I&E, and 717.1 million pounds of potential future biomass production is lost. The

¹ Age 1 equivalent losses are calculated using the the Equivalent Adult Model (EAM), a method for expressing I&E losses as an equivalent number of individuals at some other life stage. The method provides a convenient means of converting losses of fish eggs and larvae into units of individual fish and provides a standard metric for comparing losses among species, years, and regions. For the section 316(b) regional case studies, EPA expressed I&E losses at all life stages as an equivalent number of age 1 individuals. For a more detailed explanation, see Chapter A5 of the Regional Studies document.

table shows about half of all age 1 equivalent losses, or 1.7 billion fish, occur in the Mid-Atlantic region. The Mid-Atlantic region also has the highest foregone fishery yield, followed by the Gulf of Mexico region and the California region. The largest amount of foregone future biomass production, 289.1 million pounds, is attributable to I&E in the North Atlantic region. More detailed discussion of the losses in each region are provided in Sections B through H of the Regional Study Document.

Table C2-1: Total Current Annual Impingement and Entrainment, By Region^a

Region^a	Age 1 Equivalents (millions)	Foregone Fishery Yield (million lbs)	Biomass Production Foregone (million lbs)
California	312.9	28.9	43.6
North Atlantic	65.7	1.3	289.1
Mid-Atlantic	1,733.1	67.2	110.9
South Atlantic ^b	342.5	18.3	28.3
Gulf of Mexico	191.2	35.8	48.1
Great Lakes	319.1	3.6	19.3
Inland	369.0	3.5	122.0
Total (weighted)	3,449.4	165.0	717.1

^a Regional results are unweighted. National totals are sample-weighted and include Hawaii.

^b EPA estimated losses in the South Atlantic by extrapolating results from the Mid-Atlantic and Gulf regions.

Source: U.S. EPA analysis, 2004.

C2-2 SUMMARY OF LOSSES: ECONOMIC VALUE

In total, EPA found 554 facilities to be in scope of the final section 316(b) Phase II rule. However, the regional estimates of baseline losses reflect only the 540 in-scope facilities that completed 316(b) questionnaires (excluding three facilities in Hawaii). In order to calculate national losses for all 554 facilities, including the three facilities located in Hawaii and the eleven other facilities that did not complete the questionnaire, EPA extrapolated losses from other facilities and regions, based on intake flows and a set of statistical weights. See Chapter II of the Regional Studies document for a more detailed discussion of the extrapolation procedure.

As mentioned in Chapter A12, EPA estimated non-use benefits only qualitatively. As a result, the Agency was not able to directly monetize the value of losses for 98.2% of the age-one equivalent losses of all commercial, recreational, and forage species for the 316(b) Phase II regulation. This means that the estimates of baseline losses presented in this section represent the losses associated with less than 2% of the total age-one equivalents lost due to impingement and entrainment by cooling water intake structures (CWISs) and should be interpreted with caution. See Chapter A9 of the Regional Case Study document for a detailed description of the ecological benefits from reduced I&E.

Table C2-2 presents EPA's estimates of the value of annual baseline I&E losses at in-scope facilities. The table shows that the total national value of fishery resources lost to I&E includes \$23.2 million in commercial fishing benefits, \$189.4 million in recreational fishing benefits, and an unknown amount in non-use benefits (\$2002, discounted at three percent). The total use value of fishery resources lost is approximately \$212.5 million per year. Total commercial and recreational losses are greatest in the Mid-Atlantic region, at \$8.4 million and \$89.6 million, respectively, for a total use value of \$97.9 million in the Mid-Atlantic region. More detailed discussions of the value of the losses in each region are provided in Sections B through H of the Regional Studies document. Additionally, as a sensitivity analysis, the Appendix to this chapter presents the value of baseline losses evaluated at a seven percent discount rate.

Table C2-2: Summary of Monetary Values of Current Impingement and Entrainment Losses (millions; \$2002; 3% discount rate)					
Region^a	Use Value of I&E Losses			Non-Use Value of I&E Losses^b	Total Value of I&E Losses
	Commercial Fishing	Recreational Fishing	Total Use Value		
California	\$6.1	\$7.5	\$13.6	n/a	n/a
North Atlantic	\$0.5	\$4.9	\$5.4	n/a	n/a
Mid-Atlantic	\$8.4	\$89.6	\$97.9	n/a	n/a
South Atlantic	\$1.9	\$30.0	\$32.0	n/a	n/a
Gulf of Mexico	\$4.1	\$12.4	\$16.5	n/a	n/a
Great Lakes	\$1.0	\$29.4	\$30.4	n/a	n/a
Inland	n/a	\$10.6	\$10.6	n/a	n/a
Total (weighted)	\$23.2	\$189.4	\$212.5	n/a	n/a

^a Regional numbers are unweighted. National totals are sample-weighted and include Hawaii.

^b EPA estimated non-use values only qualitatively.

Source: U.S. EPA analysis, 2004.

REFERENCES

U.S. Environmental Protection Agency (U.S. EPA). 2004. *Regional Studies for the Final Section 316(b) Phase II Existing Facilities Rule*. EPA-821-R-04-006. February 2004.

Appendix to Chapter C2

This appendix summarizes the monetary values of current I&E losses using a 7 percent social discount rate instead of a 3 percent rate. The results of this sensitivity analysis are presented in Table C2-A-1.

Table C2-A-1: Summary of Monetary Values of Current I&E Losses (millions; \$2002; 7% discount rate)					
Region ^a	Use Value of I&E Losses			Non-Use Value of I&E Losses ^b	Total Value of I&E Losses
	Commercial Fishing	Recreational Fishing	Total Use Value		
California	\$4.4	\$6.1	\$10.5	n/a	n/a
North Atlantic	\$0.4	\$4.3	\$4.7	n/a	n/a
Mid-Atlantic	\$7.3	\$82.5	\$89.9	n/a	n/a
South Atlantic	\$1.7	\$28.1	\$29.8	n/a	n/a
Gulf of Mexico	\$3.4	\$11.2	\$14.6	n/a	n/a
Great Lakes	\$0.9	\$26.7	\$27.6	n/a	n/a
Inland	n/a	\$9.5	\$9.5	n/a	n/a
Total (weighted)	\$18.9	\$172.9	\$191.8	n/a	n/a

^a Regional numbers are unweighted. National totals are sample-weighted and include Hawaii.

^b EPA estimated non-use values only qualitatively.

Source: U.S. EPA analysis, 2004.

THIS PAGE INTENTIONALLY LEFT BLANK